JHR 43: 1–8 (2015)
doi: 10.3897/JHR.43.4546
http://jhr.pensoft.net

RESEARCH ARTICLE

JOURNAL OF Hymenoptera RESEARCH
A peer-reviewed open-access journal
The International Society of Hymenopterists

A new Nearctic *Scolioneura* (Hymenoptera, Tenthredinidae) mining leaves of *Vaccinium* (Ericaceae)

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Academic editor: *S. Schmidt* | Received 19 January 2015 | Accepted 5 March 2015 | Published 27 March 2015

http://zoobank.org/562D30D0-D05A-4F8D-8CA1-F3BED4B80A47

Citation: Smith DR, Eiseman CS, Charney ND, Record S (2015) A new Nearctic *Scolioneura* (Hymenoptera, Tenthredinidae) mining leaves of *Vaccinium* (Ericaceae). Journal of Hymenoptera Research 43: 1–8. doi: 10.3897/JHR.43.4546

Abstract

Scolioneura vaccinii Smith & Eiseman, **sp. n.**, is described. It was reared from blotch mines in *Vaccinium parvifolium* Sm. (Ericaceae) collected in Washington State, USA. This is the first known native species of *Scolioneura* in the Nearctic Region and the first known sawfly leaf miner of *Vaccinium* as well as the order Ericales. Characters are given to separate it from other species of *Scolioneura*, and the life history is presented. One parasitoid, *Shawiana* sp. (Braconidae) was reared from the leaf mines.

Keywords

Sawfly, Symphyta, leaf miner, red huckleberry, parasitoid, Braconidae

Introduction

The four known species of *Scolioneura* Konow (Heterarthrinae: Fenusini) are exclusively Palearctic, one of them being adventive in North America (Taeger et al. 2010). All are leaf miners. Both *S. betuleti* Konow, 1894, and *S. vicina* (Klug, 1816) are on *Betula*, the former also recorded from *Alnus*, and *S. tirolensis* Enslin, 1914, is on *Salix* (Liston, 2007). The host of *S. hyrcana* Benson, 1968, known only from northern Iran,

is unknown. Here, we describe a new species of *Scolioneura* from Washington State, which represents the apparent first native species of the genus in the Nearctic Region. It also is the only known sawfly leaf miner of *Vaccinium* as well as Ericales.

The two species on *Betula*, *S. betuleti* and *S. vicina*, cannot be distinguished morphologically. Information on phenology is necessary for their identification. Altenhofer and Taeger (1998) chose to keep these species distinct based on phenology, the former a late summer form and the latter a spring form. Although MacQuarrie et al. (2007) found no genetic differences between the two and hypothesized that they constitute a single bivoltine species, they continue to be listed as separated species (Taeger et al. 2010). The early season *S. vicina* is the name applied to the species adventive in North America, and it occurs from eastern Canada to Alberta (Digweed et al. 2009).

Liston (2007) gave notes on the life history and larva of *S. tirolensis*, pointing out some morphological characters to distinguish it from *S. vicina* and *S. betuleti*. Nothing is known about *S. hyrcana* besides the original description (Benson 1968).

Materials and methods

Initial observations and collections were made by CSE and J. A. Blyth during a survey of leaf mining insects throughout western USA, September to November 2012. NDC and SR conducted a targeted search for mines on *Vaccinium* during a visit to the Seattle, WA, area in August 2013.

Leaves containing larvae or parasitoid cocoons were collected in plastic vials, which were checked daily (when possible) until all insects had emerged. Upon emerging, sawfly larvae were placed in small containers partially filled with moistened soil. In 2012, locally available soil from Washington was used; in 2013, a roughly 1:1 mixture of sand and peat was used. These containers were stored in a refrigerator at 1–3 °C from mid-December 2012 to 15 April 2013, and from 6 November 2013 to 25 February 2014. After removal from refrigeration, lids were removed from the containers, which were placed in sealed plastic bags and were checked daily.

Photographs of leaf mines and live specimens (Figs 1, 2, 8–11) were produced using a Canon EOS Rebel XSi SLR digital camera, MP-1 65 mm macro lens, and Macro Twin Lite MT-24EX flash unit. Images of the preserved adult (Figs 3–7) were obtained using an EntoVision Imaging Suite that included a firewire JVC KY-75 3CCD digital camera mounted to a Leica M16 zoom lens via a Leica z-step microscope stand. Multiple focal planes were merged using Cartograph 5.6.0 (Microvision Instruments, France) software.

Results

One adult sawfly and five braconid parasitoids were reared from leaf mines in *Vaccinium* collected containing either larvae or cocoons. The sawfly emerged in April 2014 from a leaf mine collected in August 2013 in Pierce County, Washington. This specimen

represents a distinct new species, and the following characters place this species in *Scolioneura*: Tarsal claw with acute basal lobe and single outer tooth; epicnemium absent; genal carina present; forewing with 2A+3A curved up at its apex; radial cell of both forewing and hind wing closed at apex; hind wing with anal cell. *Scolioneura* was not included in the key to Nearctic Heterarthrinae by Smith (1971). It would go to couplet 11 containing *Metallus* Forbes and *Messa* Leach (now *Fenusella* Enslin). *Scolioneura* is distinguished from both *Metallus* and *Fenusella* by the presence of a genal carina.

***Scolioneura vaccinii* Smith & Eiseman, sp. n.**

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Figs 1–9

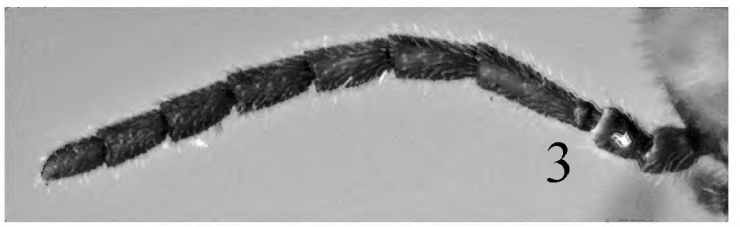
Description. Female: Length, 3.0 mm. Antenna black; ventral surface, especially antennomeres 3–5 paler, dark orange. Head black; mandible reddish brown with apex black; palpi whitish. Thorax black. Legs yellowish with coxae and fore- and midtrochanters black; hind trochanter yellowish apically. Abdomen reddish brown with segments 1–3 and 9 black, tergite 4 slightly darker than 5–8; sheath black. Wings uniformly hyaline, veins and stigma black. Head and body smooth, shiny, without sculpture except for a few punctures at apex of mesoscutellum and very fine meshlike microsculpture on mesonotal lateral lobes. Head and thorax with short, fine white pubescence.

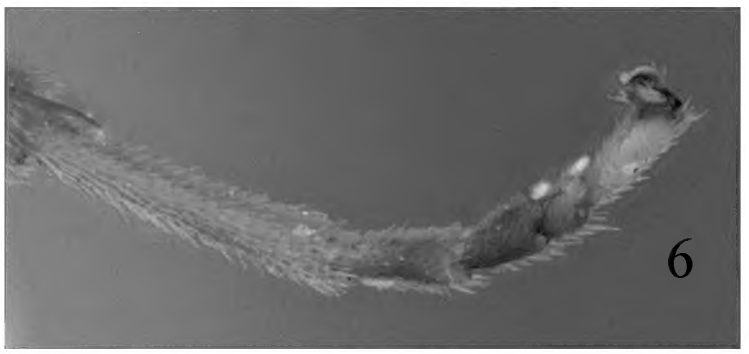
Antennal length 1.3× head width; 3rd antennomere 1.5× length of 4th antennomere and 3.5× longer than apical width; 4th antennomere 2× longer than apical width (Fig.3). Eyes slightly converging below; lower interocular distance about 1.2× eye height (Fig. 4). Distances between eye and hind ocellus, between hind ocelli, and between hind ocellus and posterior margin of head as 1.0: 0.9: 0.7. Postocellar area about 2× broader than long. Genal carina present. Forewing with first cubital crossvein absent, vein 2A+3A turned up at apex, almost meeting 1A; hind wing with cell R closed, anal cell present, cells Rs and M absent. Cenchri about as far apart as breadth of one. Hind basitarsomere subequal to length of remaining tarsomeres combined. Tarsal claw without inner tooth, with large, acute basal lobe. Tarsal pulvilli absent on hind tarsomeres 1 and 2, present only on hind tarsomeres 3 and 4 (Fig. 6). Sheath in lateral view straight above, rounded below, with long curved hairs (Fig. 7); from above broad, parallel sided and rounded at apex. Entire lancet not examined; apex protruding from sheath (Fig. 7) with rather deep, rounded serrulae.

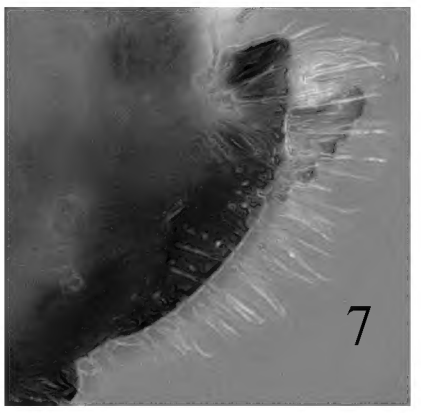
Male: Unknown.

Prepupa: White to yellowish with slightly darker head and lateral and dorsal lines; eyespot and apex of mandible black (Fig. 8). Abdominal segments apparently with 3 dorsal annulets; apical tergum rounded at apex.

Holotype. Female, labeled "Washington, Pierce Co., Tacoma, Point Defiance, 13.VIII.2013, em. 22.IV.2014, C. S. Eiseman, ex *Vaccinium parvifolium*, #CSE 1092." Altitude ~60 m. Deposited in the National Museum of Natural History, Smithsonian Institution, Washington, DC.







Figures 1–7. *Scolioneura vaccinii*. **1** Dorsal **2** Lateral **3** Antenna **4** Head front **5** Head dorsal **6** Hind tarsus **7** Sheath, lateral.

Other specimens. Three specimens were examined that appear identical to *S. vaccinii*, but all have a black abdomen. The color could vary, especially in the western mountains where melanic forms of some species occur, e.g., *Paracharactus montivagus* (Cresson, 1880) and *Lagonis nevadensis* (Cresson, 1880) (Smith 1969). However, we prefer to base the species on the reared specimen and, because of some doubts, not include the darker specimens in the type series. The data are as follows: WASHINGTON: Whatcom Co., Mt. Baker Ski area, VIII.2.1972, W. J. Turner,W. B. Garnett, collectors (altitude ~1,100–1,550 m) (1 ♂), same but additional label "dry ice Malaise

Trap" (1 ♂); Skam. Co., 42 mi S.E. Randle, USFS Rt. N84, VII.29.1972, dry ice Malaise trap, W. J. Turner, W. B. Garnett collectors (altitude ~1,400 m) (1♀). All from the Washington State University collection, Pullman, Washington. The males are similar in color and structure to the female.

Host. Adult reared from leaf mine in red huckleberry, *Vaccinium parvifolium* Sm. (Ericaceae). Sawfly larvae, probably also this species, found in leaf mines of *V. membranaceum* Douglas ex Torr.

Etymology. Based on the genus name of the host plant, *Vaccinium*.

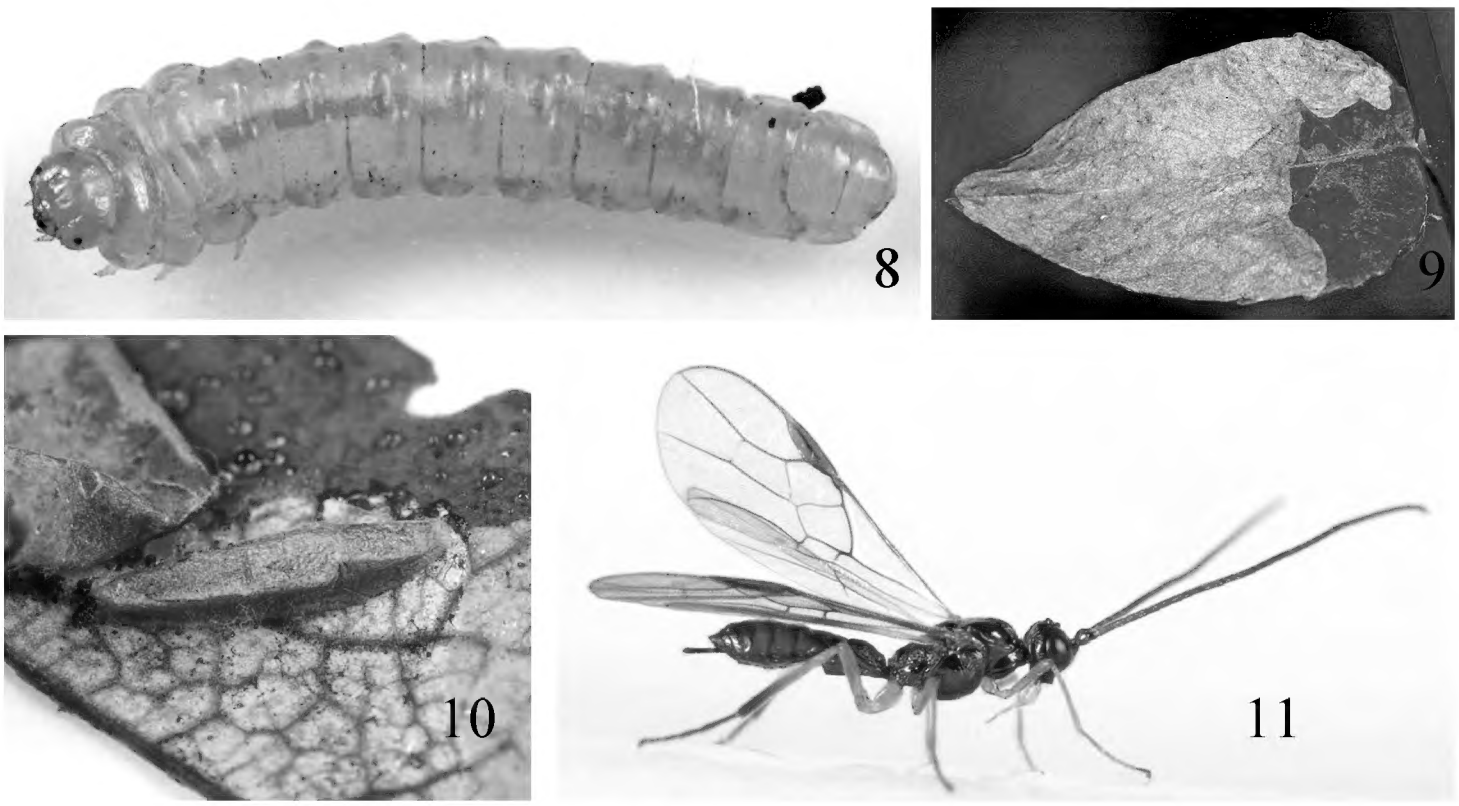
Discussion. This species is characterized by the short antennae, about 1.3× the head width; lower interocular distance slightly longer than eye height; mostly reddish-brown abdomen; absence of the first cubital crossvein in the forewing; presence of pulvilli on only hind tarsomeres 3 and 4; and smooth, shiny mesoscutellum with only a few punctures on the posterior margin.

Liston (2007) separated *S. tirolensis* from *S. betuleti* and *S. vicina* as follows: In *S. tirolensis* the leg color tends to be darker (but highly variable); first cubital crossvein present, though faint; shorter antenna, about 1.5× head width; third antennomere 3.5× as long as apical width; third antennomere about 1.5× as long as fourth. In *S. betuleti* and *S. vicina*, the leg color is lighter; first cubital crossvein absent; antennae longer, 2× the head width; and the third antennomere is 5–6× as long as its apical width and only slightly longer than the fourth. *Scolioneura vaccinii* is closer to *S. tirolensis*, sharing the short antennae, but *S. vaccinii* differs by the absence of the first cubital crossvein, even shorter antennae, presence of pulvilli only on hind basitarsomeres 3 and 4, the smooth, shiny mesoscutellum, and the mostly reddish-brown abdomen. In *S. tirolensis*, the first cubital crossvein is present, pulvilli are present on hind basitarsomeres 1–4, the mesoscutellum is densely punctate with punctures more numerous on the posterior half, and the abdomen is usually black.

Scolioneura hyrcana was not examined, but Benson (1968) separated it from the European species by the enlarged eyes, which are strongly converging below with the lower interocular distance much less than the eye height, and by the presence of tarsal pulvilli only on the two apical tarsomeres. *Scolioneura vaccinii* shares the presence of pulvilli only on hind basitarsomeres 3 and 4, but differs by the smaller eyes which are farther apart than the eye height.

Life history notes. Larvae are solitary and form simple, more or less full-depth blotch mines (Fig. 9), each completing development within a single leaf as is typical of Fenusini. Completed mines occupy 3.5 to 8.5 cm^2, with smaller leaves being entirely mined out. Frass is in the form of discrete, elongate fecal pellets, up to about 0.4 mm by 0.2 mm, which are scattered through the mine at random. When mature, the ~7.0 mm larvae exit their mines and burrow into the ground to overwinter.

Leaf mines on *Vaccinium parvifolium* and *V. membranaceum* containing sawfly larvae were first noted from 4 to 10 October 2012, to the south of Mount Rainier (Pierce Co.) and at several locations on the Olympic Peninsula (Clallam, Jefferson, and Grays Harbor counties). The type specimen was reared from a larva found mining



Figures 8–11. 8 *Scolioneura vaccinii*, prepupa **9** Leaf mine of *S. vaccinii* **10** Cocoon of *Shawiana* sp. in leaf mine of *S. vaccinii* **11** *Shawiana* sp., lateral.

a *V. parvifolium* leaf on 13 August 2013. Since all collected larvae overwintered in soil, there is currently no indication of more than one generation per year. The April emergence date for the type specimen is undoubtedly abnormally early, due to the prepupa having been exposed to artificially warm temperatures. The other known specimens were trapped as adults between 29 July and 2 August, consistent with a single generation emerging in early summer and giving rise to larvae that mine from August to October.

Vaccinium plants were searched in northern Idaho in late September 2012 and in northern California in October 2012, but no leaf mines were found. Similar mines found on *Rhododendron menziesii* Craven (Ericaceae) along Boulder Creek in Bonners Ferry, Idaho on 28 September 2012 possibly were made by the same or a related species. Only a few examples were found, and all were empty.

The 2012 collections yielded four braconid wasps, which emerged 18–27 November 2012 and 4–8 May 2013. The 2013 collection yielded one more, which emerged on 7 September. All had spun elongate, pale brown cocoons, 5 mm long by 1 mm wide, inside the leaf mines (Fig. 10). All five braconids belonged in the genus *Shawiana* van Achterberg (Fig. 11). Two described species in this genus are known from the Nearctic, both in the eastern United States. *Shawiana metalli* (Muesebeck) is a parasitoid of *Metallus rohweri* MacGillivray; *S. phyllotomae* (Muesebeck) was introduced from Europe to control *Heterarthrus nemoratus* (Fallén), and is also recorded from *Fenusa pumila* Leach (Muesebeck 1932, Marsh 1979). All of these hosts, like those of most Palearctic species, are leaf-mining sawflies (Achterberg 1983). Three of our *Shawiana* specimens are deposited in the Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Ontario.

Acknowledgments

Julia A. Blyth, Northfield, MA, took part in the initial discovery and collecting of leaf mines on *Vaccinium*. J. L. Fernández-Triana, Canadian National Collections of Insects, provided the braconid identification, which was confirmed by C. van Achterberg, Naturalis Biodiversity Center, Leiden, Netherlands. We thank A. Taeger and A. D. Liston, Senckenberg Deutsches Entomologisches Institut, Münchenberg, Germany, for loan of *S. tirolensis* specimens and Richard Zack, Department of Entomology, Washington State University, Pullman, Washington for loan of specimens. Mention of trade names or commercial products in this publication is solely for the purpose of providing specific information and does not imply recommendation or endorsement of the USDA. USDA is an equal opportunity provider and employer.

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